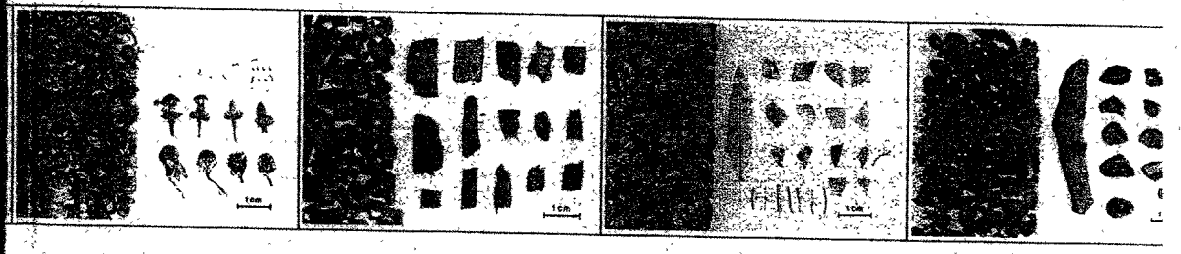
Norman Grainger Bisset (Ed.)

Max Wichtl

Herbal Drugs and Phytopharmaceuticals

A handbook for practice on a scientific basis



With a foreword by
J. David Phillipson

181 monographs
434 full colour illustrations
312 black-and-white illustrations
311 chemical structures

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Ginseng radix (DAB 10), Ginseng (BHP 1/1990), Ginseng root

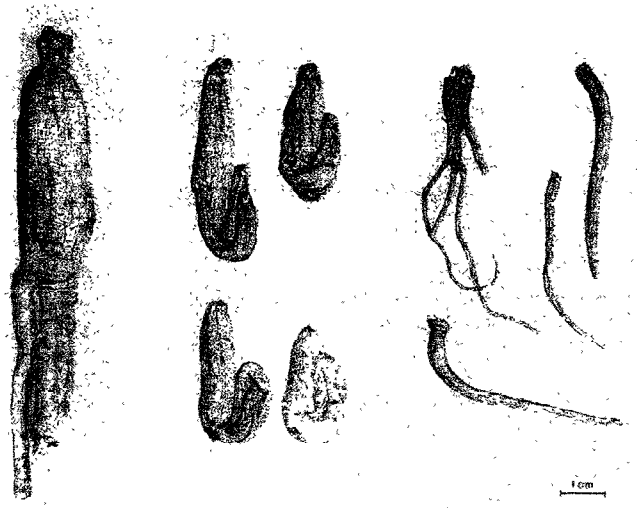


Fig. 1: Ginseng

There are several commercial varieties, including Korean ginseng, which is the most highly valued, followed by Chinese, Japanese, and American ginseng (this last variety comes mostly from *Panax quinquefolius*). Among the varieties of Korean ginseng, there are the white variety (official in the DAB 10, ÖAB, and Ph. Helv. VII), the roots of which after harvesting and washing are immediately dried, and the red variety, which is official in Japan and which are cartilaginous, translucent, and reddish as a result of the roots being first scalded for $1^1/_2$–4 hours and then dried. The illustration shows white ginseng – the commercial forms "curved" (centre) and "slender tails" (right: not official).

Description: The cylindrical roots are transversely rugose in the upper part, from the middle sometimes repeatedly divided, and they taper towards the bottom. Often, the roots still bear the remains of the stem like a crown. The light yellow to light brown bark contains scattered small orange-red resin glands. Internally, the root is white to yellowish, cartilaginous, and brittle.

Odour: Faint and pleasant.

Taste: At first bitter, then sweet and mucilaginous.

Fig. 2: *Panax ginseng* C.A. MEYER

An up to 80 cm tall herb with palmate, verticillate leaves. Flowers small and grouped 15–20 in umbels.

Fig. 3: *Panax ginseng* C.A. MEYER, tap root and lateral roots

DAB 10: Ginsengwurzel
ÖAB: Radix Ginseng
Ph. Helv. VII: Ginseng radix

Plant source: *Panax ginseng* C.A. MEYER (syn. *Panax schinseng* NEES), ginseng (Araliaceae).

Synonyms: Panax, Korean ginseng (Engl.), Ginsengwurzel, Kraftwurzel (Ger.), Racine de ginseng (Fr.).

Origin: Native to the montane forests of eastern Asia. Cultivated in China, Japan, former USSR, and Korea. The drug is imported principally from Korea, China, and Japan; the root of *Panax quinquefolius* L. is imported from the United States (but it is not official).

Constituents: 2–3% Ginsenosides (triterpene saponins), of which ginsenosides Rg_1, Rc, Rd, Rb_1, Rb_2, and Rb_0 are quantitatively the most important (Russian investigators use the designations panaxosides A–F); ca. 0.05% essential oil (limonene, terpineol, citral, polyacetylenes); ubiquitous substances such as sugars, starch, etc.
More recently, a series of poly-acetylenes, the ginsenoynes A-K, some of which are acetylated, has been isolated [14].

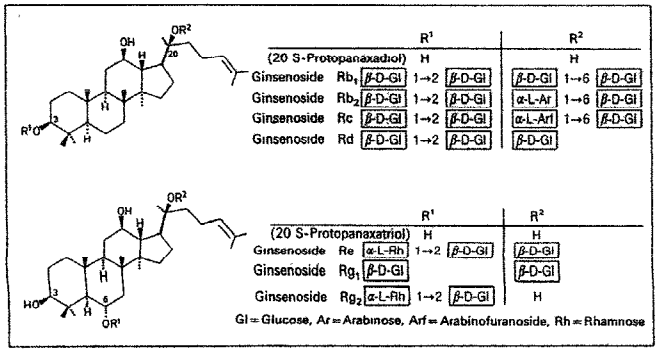
Indications: Ginseng derives from East Asian medicine, where the drug has been used for thousands of years as a tonic (and presumably also as an aphrodisiac); it should therefore not be judged by the criteria of modern rational therapeutics. This drug is not a therapeutic agent for the treatment of particular illnesses, but rather a prophylactic which heightens in an unspecific way (details of which have only now been investigated scientifically) the resistance of the organism to various environmental influences and stimuli and/or reduces the disposition or susceptibility to illness [1].
Nowadays, the "active principles" are considered to be the ginsenosides, some of which have been examined pharmacologically in detail, so that a very extensive literature is now available; but other ginseng constituents also have pharmacological activity.
Interestingly, some of the ginsenosides have opposing activities, e.g. ginsenoside Rg_1 raises the blood pressure and is a central stimulant, while ginsenoside Rb_1 lowers the blood pressure and is a central depressant.
The standardization of ginseng preparations is therefore of particular significance.
Ginseng is an adaptogen, i.e. it is a substance that is able to improve the ability of an organism to adapt to differing external or internal disturbances [2].
The immunostimulant action of ginseng extracts has been repeatedly confirmed in animal experiments [3–5]. Various groups of workers have described in detail the enhancement of RNA and protein biosynthesis after administration of ginseng extracts [6, 7].
Also worth noting is the effect on carbohydrate and lipid metabolism; there are results from both animal experiments and clinical studies [8, 9].
Clinical work has demonstrated that ginseng affects human performance and ability to react in a positive way, though it has to be realized that the effect does not take place immediately (in Chinese medicine, ginseng has been, and is, taken over rather long periods of time).
Good reviews are in [10, 11, 15].

Side effects: Relatively rare and only with high doses and/or use over very long periods of time. They include sleeplessness, nervousness, diarrhoea (particularly in the morning), menopausal bleeding, and hypertony [12]. See also [16].

Making the tea: Boiling water is poured over 3 g of the finely chopped drug, covered and allowed to draw for 5–10 min., and then passed through a tea strainer. The infusion is taken one to three times a day for a period of three to four weeks. Many manufacturers recommend taking the cut drug as such and chewing it.
1 Teaspoon = ca. 3.5 g.

Herbal preparations: The drug is offered in the form of an instant tea (and in 3 g tea bags).

Phytomedicines: The powdered drug (in some cases with a standardized ginsenoside content) or extracts as prepared geriatric remedies, e.g. Geriatric Pharmaton® (capsules), etc., and roborants and tonics, e.g. Ginsana® Ginseng, Kumsan Ginseng Much, etc.
Among the products available on the UK market are [15]: Blackmore's Ginseng Tablets, Vitalia Gerimax Tablets, Booker Healthcrafts Korean Ginseng Tablets, Herbal Laboratories Herbal Korean Ginseng Tablets, Larkhall Naturtabs Red Panax Ginseng, Unichem Pharmaton Capsules,



		R^1		R^2
(20 S-Protopanaxadiol)		H		H
Ginsenoside	Rb_1	β-D-Gl 1→2 β-D-Gl		β-D-Gl 1→6 β-D-Gl
Ginsenoside	Rb_2	β-D-Gl 1→2 β-D-Gl		α-L-Ar 1→6 β-D-Gl
Ginsenoside	Rc	β-D-Gl 1→2 β-D-Gl		α-L-Arf 1→6 β-D-Gl
Ginsenoside	Rd	β-D-Gl 1→2 β-D-Gl		β-D-Gl

		R^1		R^2
(20 S-Protopanaxatriol)		H		H
Ginsenoside	Re	α-L-Rh 1→2 β-D-Gl		β-D-Gl
Ginsenoside	Rg_1	β-D-Gl		β-D-Gl
Ginsenoside	Rg_2	α-L-Rh 1→2 β-D-Gl		H

Gl = Glucose, Ar = Arabinose, Arf = Arabinofuranoside, Rh = Rhamnose

Extract from the German Commission E monograph
(BAnz no. 11, dated 17. 01. 1991)

Uses
As a tonic to combat feelings of lassitude and debility, lack of energy and ability to concentrate, and during convalescence

Contraindications
None known.

Side effects
None known.

Interactions with other remedies
None known

Dosage
Unless otherwise prescribed: daily dose, 1–2 g drug; preparations correspondingly.

Mode of administration
Comminuted drug for infusions, powdered drug and galenical formulations for internal use

Duration of use
As a rule, up to 3 months.

Effects
In various stress models, e.g. the immobilization test and the cold test, the resistance of rodents is increased.

Power Ginseng GX 2500 Extract Capsules, English Grains Red Kooga Capsules and Tablets, Boots Second Nature Korean Ginseng Tablets, etc.

Authentication: Macroscopically, authentication is not possible with complete certainty, since the appearance of the commercial products varies considerably. Microscopical features include the occurrence of large secretory canals (only in the bark) containing a brownish yellow resin, whose size diminishes towards the inside; near the cambium, they form an almost continuous ring. Two- to four-seriate, to some extent tortuous medullary rays traverse the rather spongy parenchyma, the cells of which contain calcium-oxalate clusters and single crystals. There is abundant starch consisting of simple and aggregate grains. See also the BHP 1/1990. Microscopic examination does not allow the differentiation of *Panax ginseng* from *P. quinquefolius* [13]. However, the following TLC procedure, which is similar to that to that given in the DAB 10, can be used for this purpose:

Test solution: 1 g powdered drug refluxed with 10 ml 70% aqueous methanol for 15 min., cooled, and filtered.

Reference solution: 5 mg aescin, 5 mg amygdalin, and 25 mg arbutin, dissolved in 10 ml methanol.

Loadings: 5 µl test solution and 3 µl, as band, on silica-gel.

Solvent system: upper phase of: ethyl acetate + butanol + water (25+100+50), 6 cm run.

Detection: after drying in a current of hot air, sprayed with anisaldehyde reagent and heated at 105–110 °C for 2–3 min.

Evaluation: in daylight. Reference solution: aescin as a blue to blue-violet zone at Rf ca. 0.3, amygdalin as a greyish green zone at Rf ca. 0.5, and arbutin as a brown zone at Rf ca. 0.8. Test solution: greyish blue to greyish violet zones of the ginsenosides Rg_1 (Rf ca. 0.7) and Re (Rf ca. 0.55), between the arbutin and amygdalin reference zones, and Rb_1, at the same Rf as the reference aescin zone but not sharply separated from other ginsenosides (Fig. 4)

The following optimized HPTLC procedure enables various ginsengs, including red (steamed) and white (dried naturally), American, and sanchi (notoginseng), to be distinguished [17]:

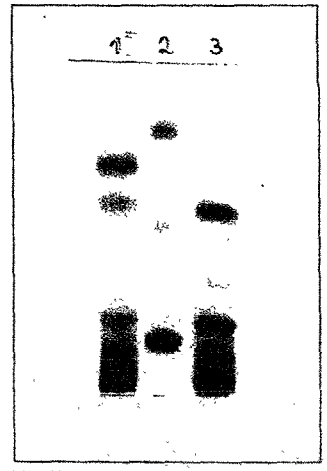


Fig. 4: TLC on 4 × 8 cm silica-gel foil
1: Official ginseng root
2: Reference substances
3: American ginseng (*Panax quinquefolius*)
For details, see the text

Test solution: 1 g powdered drug refluxed with 40 ml chloroform and the solution discarded; then refluxed for 1 h with 50 ml methanol and solution passed through a basic alumina column (15 g; 1 cm ⌀), followed by elution with 50% methanol; hydrophilic components removed from the eluate with butan-1-ol and the solution taken to dryness in a vacuum desiccator over phosphorus(V) oxide; residue (ca. 8 mg) dissolved in 0.1 ml methanol (= crude ginsenosides); American ginseng and sanchi, 4 mg residue dissolved in 0.1 ml methanol.

Solvent system: lower phase of chloroform (no ethanol present) + ethyl acetate + methanol + water (15 + 40 + 22 + 10) after standing overnight at 8–10 °C, 7 cm run on silica gel $60F_{254}$ at 26–28 °C for best results..

Detection: dipped in 5% ethanolic sulphuric acid for 2 sec., followed by heating at 105 °C for 1 min.; then dipped for 2 sec. in liquid paraffin + hexane (1 + 1) to stabilize the fluorescence for more than 24 h.

Evaluation: in UV 366 nm light. 19 zones divided into 4 groups: A (ginsenosides Ra, Rb_1, Rb_2, Rb_3), B (Rc, Re, Rd), C (Rg_1, Rf, F11, F2, Rg_2), and D (6 minor ginsenosides).

Macro-fingerprints (based on densitometric measurements): ginseng (group A>B≳C>D) pattern more complex than that of American ginseng (group A≥B>>C>>>D) and much more complex than that of notoginseng (sanchi); in red ginseng more minor ginsenosides (group D) than in white ginseng.

The clean-up stage causes some loss of ginsenosides, but the resulting extract gives better chromatograms.

Quantitative standards: DAB 10: *Ginsenosides*, not less than 1.5% calculated as ginsenoside Rg_1. *Foreign matter*, not more than 2%. *Loss on drying*, not more than 12%. *Ash*, not more than 8.0%. *HCl-insoluble ash*, not more than 1.0%.

ÖAB: 69–71% *ethanol extractive*, not less than 14%. *Ash*, not more than 4%.

Ph. Helv. VII: *Total ginsenosides*, not less than 2.0% calculated as ginsenoside Rg_1 (M_r 800.0). *Sulphated ash*, not more than 12.0%.

BHP 1/1990: 70% *Ethanol extractive*, not less than 20%. *Foreign matter*, not more than 2%. *Loss on drying*, not more than 10%. *Total ash*, not more than 8%. *HCl-insoluble ash*, not more than 2%.

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